together with all the ternary alloys and systems of a higher order. The second volume now under notice deals almost exclusively with the iron-carbon system.

Dr. Guertler has thus undertaken an immense task, and has shown marvellous industry in the sifting and presentation of so large a mass of material. The published data referring to each system have been critically reviewed, temperatures have been reduced as far as possible to a uniform scale, and the equilibrium diagrams in which the author embodies his conclusions represent a large amount of patient labour and acute criticism. It is impossible, however, to escape a doubt whether so great an undertaking is justified in the present state of the science. It is well known that very many of the published investigations on this subject have been carried out with rough experimental methods and impure materials, and can only be regarded at best as preliminary surveys. Even the author's critical examination of the data cannot bring conclusive results out of such material. At the present time many of the binary systems are undergoing re-examination by competent investigators, often with surprising results, and for some years to come any systematic account of metallic alloys must be regarded as merely provisional. Such a work as the present is inevitably out of date before its publication is complete. This being admitted, however, all metallographers must be deeply grateful to Dr. Guertler, who has provided them, in a compact form, with a carefully sifted collection of experimental data, otherwise difficult of access, enriched with comments of a thoroughly sound and practical character.

It is an astonishing fact that six hundred pages are required to give an account of the equilibria in a single binary system, that of iron and carbon. The volume devoted to these alloys leaves out of consideration the whole field of the technical treatment of iron and steel, of their physical and mechanical properties, and of the influence of other elements on the system. Probably no better guide than the author could be found through the controversial mazes of this part of the subject, and his conclusions are to be received with all respect. The recent revolutionary proposals of Wittorf and others are subjected to a searching analysis, leading to the conclusion that cementite, Fe_3C, has a range of stability above 1700°, graphite being the stable solid phase between 1700° and 1360°, whilst the existence of a further carbide, Fe_4C, with a small range of stability, is regarded as probable. The thorny subject of the nature of martensite and troostite receives very full treatment, but on this point it would be difficult to find two metallographers who are in complete agreement, and the author's views are not likely to escape criticism. Ingenious diagrams, sometimes having the curves corresponding with metastable equilibria printed in colours, are used in this volume, which is indispensable to all who are seriously interested in the constitution of cast-iron and steel.

The book is admirably printed. In the course of constant use few misprints have been detected, with the exception of proper names, which are rather frequently mis-spelled. References are only given by author's name and year of publication, the details having to be sought in a bibliography, which is to appear on the completion of the work. In the first volume it would have been of advantage to provide a larger number of photo-micrographs in some sections, but those which are included, most of which are fairly familiar, are well reproduced. The second volume is profusely illustrated.

C. H. DESCH.

ZOOLOGY, EMBRYOLOGY, AND HEREDITY.

(1) *Handbuch für Biologische Uebungen.* By Prof. P. Röseler and H. Lamprecht. Zoologischer Teil. Pp. xii+574. (Berlin: Julius Springer, 1914.) Price 27 marks.

(2) *Konstitution und Vererbung in ihren Beziehungen zur Pathologie.* By Prof. F. Martius. Pp. viii+258. (Berlin: Julius Springer, 1914.) Price 12 marks.

(3) *Leitfaden für das Embryologische Praktikum, und Grundriss der Entwicklungslehre des Menschen und der Wirbeltiere.* By Prof. A. Oppel. Pp. vii+313. (Jena: Gustav Fischer, 1914.) Price 10 marks.

(4) *Studies in Cancer and Allied Subjects.* Vol. iv., Contributions to the Anatomy and Development of the Salivary Glands in the Mammalia. (Conducted under the George Crocker Special Research Fund at Columbia University.) Pp. v+364+plates. (New York: Columbia University Press, 1913.) Price 5 dollars net.

(1) THIS handbook appears to be meant specially as a guide to teachers who have to conduct courses of practical instruction in zoology in higher schools and colleges, but whoever works conscientiously through it, whether a prospective school teacher or not, will have gone through an excellent course in practical zoology on the "type" system. He will have given himself a practical training of a much sounder and more extensive kind than is, we fear, commonly attempted by those who have to conduct such courses in the schools of this country. We fancy that if our science masters had to work through

a course such as is given in the book now under notice we should find them teaching in their turn something rather different from what so frequently, with us, masquerades under the name "nature study."

The opening chapters of the book are of a general nature. A useful inventory of laboratory requirements is followed by practical directions regarding the use of the microscope. Methods of observation of the living animal are described, and thereafter the technique of fixing, staining, section-cutting, and so on. A chapter on general histology gives good practical directions for obtaining the various types of tissue, and that is followed by a chapter on physiology, with good practical exercises dealing with digestion, respiration, milk, blood, and urine.

About four-fifths of the book are taken up by special exercises upon representatives of the various main groups of the animal kingdom. In the chapter on protozoa the sporozoa as exemplified by Gregarina and Monocystis are taken first, then flagellates and ciliates, while our old friend Amœba comes last. This is a reversal of the usual order, and its advantage seems to us very questionable, for, whatever unexpected complexities may turn up in the life-history of *Amoeba proteus,* the fact remains that the ordinary phase in the life-history, which alone is studied in practical classes in zoology, represents an extraordinarily simple and unspecialised type of animal —quite without a rival as a subject of study for the beginner in zoological science.

The chapter on Cœlenterata deals with a couple of sponges, Leucandra and Spongilla (why not a simple Ascon?), Hydra (we notice its cœlenteron is miscalled cœlom!), *Obelia geniculata* (the figure of the hydroid phase appears to represent another species), Aurelia, Nausithoe, Actinia, Alcyonium, and Corallium. Chapters on worms, arthropods, molluscs, echinoderms, tunicates—each deal with various representative members of the group; while vertebrates are illustrated by Amphioxus, Petromyzon, Scyllium, Leuciscus, Rana, Lacerta, Columba, Lepus.

It will be seen that the book covers a very wide area and on the whole it does it well, although necessarily some of the descriptions are very short. Both in the introductory chapters and scattered throughout the book are to be found hints on technique valuable even to those who have considerable experience. The book is amply illustrated, though the illustrations vary much in quality. Some are excellent, for example, those of Astacus and Hirudo (the latter after Hatschek and Cori's beautiful figures); while others, such as that of the transverse section through the earthworm, are very rough. The figures of Ascaris eggs should also be revised for a future edition. On the whole we find the book wonderfully free from gross errors, and we think it will be very useful to students.

(2) This book, with its quaint expressive literary style, and its occasional flashes of humour, forms a very readable section of the Enzyklopädie der klinischen Medizin. The first half of the book is devoted to emphasising the importance of the individual constitution as a factor in disease. The two extreme schools of thought on this subject are referred to: on one hand, the extreme bacteriologists to whom the body is little more than a test-tube containing nutritive medium in which the inoculated microbe can grow and multiply, and to whom the mere mention of the word constitution is looked upon as an attack upon their science; and on the other, the extreme constitutionalists, some of whom have gone the length of looking upon germs as the mere harmless accompaniments of illness.

The second half of the book is devoted to heredity in relation to pathology. Chapter iii. gives a crisply written and, on the whole, fair-minded summary of the theory of heredity and of the main facts of cytology related to it. The author's attitude is eminently common-sensible, and shows a width of view difficult of attainment by the specialist in the study of heredity. He gives full credit of the enunciation of the main idea of the continuity of the germ plasm to Galton in 1875, *i.e.* before both Jäger and Weismann. Due space is given to Mendelism. We notice the verb "mendeln," and the substantive "Nichtsalsmendelianer," though we miss the suggestion of still further developments of the vocabulary on the lines of mendelacious, mendelacity, mendelinquency, mendelette, and so on. The final chapter, which might with advantage have been longer, gives a summary of some of the more important facts of observation in pathology and teratology in relation to heredity.

(3) The author of that admirable encyclopædia entitled the "Lehrbuch der mikroskopischen Anatomie," has in the work now under review succeeded in writing an uncommonly dull book upon an uncommonly fascinating subject. The way in which the book opens—with the sentence "Das volkommenste Forschungs- und Unterrichtsmittel, über welches die beschreibende Embryologie heute verfügt, besteht darin, dass ein Embryo in eine Reihe von dünnen Schnitten zerlegt wird, welche mikroskopisch untersucht werden können"—illustrates admirably the character of the whole work, which is typically

German in its combination of trustworthiness in regard to detail, with almost complete absence of that wide "grip" which makes a work, or a worker, a living force in the development of the science.

Chapter i. sketches the objects and general method of a course in practical embryology; chapter ii., consisting of less than a page, is entitled "Embryology and 'Entwicklungsmechanik'"; chapter iii., about half a page in length, has the somewhat ambitious title, "Evolution, Epigenesis, Neo-evolution, Neo-epigenesis." After this it is somewhat startling to find that chapter v., "On some of the causal factors of development," which teaches the student various excellent Rouxian expressions in which his—and his teacher's—ignorance may be safely wrapped up, extends over some eight pages. Many long and Greek-looking words occur in this chapter, and we confess to being not altogether convinced that they serve a useful purpose. We do not quite see of what special advantage it is to a German student—apart from some slight economy in time or ink—to refer to the wandering apart of cells which had come together as "Cytochorismus," instead of using the expressive vernacular "Wiedervoneinanderlösung." Technical terms are, of course, very necessary things, but there is often a danger—and it is one from which biological science is suffering greatly at the present time—that the affixing of a new technical name may be counted as *explaining* a natural phenomenon, or as making at least a definite step towards explanation.

The first section of the book is completed by a short but good account of simple embryological technique suitable for elementary students, followed by a short sketch of developmental mechanics and a syllabus of work for a course in practical embryology.

The second section of the book gives a good, though rather too short, general account of germ cells, early stages in development, and fœtal membranes. The third section gives directions, illustrated by outline drawings, for working through series of sections of various vertebrate embryos, while the concluding section of the book gives a short but good sketch of vertebrate organogeny.

The book is excellently illustrated. It is too short, and it has, as we have indicated, other faults, but it is, on the whole, trustworthy, and will, we doubt not, serve its purpose to the student who hustles through a course in vertebrate embryology with the idea of picking up some knowledge of its methods rather than of becoming acquainted with its general principles as a branch of evolutionary science.

(4) Vol. iv. of the "George Crocker Studies in Cancer and Allied Subjects" consists of a series of eight valuable memoirs upon the anatomy and development of the salivary glands of the mammalia. Adult anatomy is dealt with by Carmalt (man, carnivora, ungulata, rodentia, insectivora, marsupialia) and Huntingdon (lower primates); embryonic development by Schulte (man, cat, pig); while the evolution of the primate salivary glands out of the presumably ancestral condition of a diffuse gland-field is discussed by Huntingdon. Taken altogether the volume forms a valuable addition to our knowledge of the morphology of the salivary glands of the mammalia, and incidentally it affords a striking tribute to the wise and broad-minded administration of the George Crocker Research Fund of Columbia University.

TROPICAL PRODUCTS.

(1) *The Cultivation of the Oil Palm. Some Essential Notes.* By F. M. Milligan. Pp. xiv + 100. (London: Crosby Lockwood and Son, 1914.) Price 2*s.* 6*d.* net.

(2) *Rubber: Its Sources, Cultivation, and Preparation.* By Harold Brown. With a Preface by Dr. W. R. Dunstan. Pp. xiii + 245 + xii plates. (London: John Murray, 1914.) Price 6*s.* net.

(3) *The Banana: Its Cultivation, Distribution, and Commercial Uses.* By W. Fawcett. With an Introduction by Sir Daniel Morris. Pp. xi + 287 + plates. (London: Duckworth and Co., 1913.) Price 7*s.* 6*d.* net.

THE trio of books under notice deal with three important tropical products, the first being chiefly associated with European colonies in western equatorial Africa, the other two being widely exploited.

(1) The luxuriance and abundance of the oil-palms in the coastal lands from Sierra Leone to the Cameroons furnish good evidence that the climate is particularly suitable and that the tree is well able to hold its own against plant and insect pests. The supply of fruit and nuts was originally obtained from wild plants, but plantations have been formed by natives and are being extended. Undoubtedly there is scope both for extended planting and for more careful cultivation. It is with the object of offering advice in these matters that Mr. Milligan has written his book. Unfortunately, although there are many allusions to his experience, the information given is exceedingly meagre; on the subjects of seed-germination, planting, and manuring, the advice is sound, but in other respects, notably as regards botanical details, the information is not only insufficient, but incorrect. The subject of oil-production is not included.